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Distributed Model Brief Overview

NWS Workshop on Hydrologic Forecasting
Prague Campus
Czech University of Agriculture
June 20-24, 2005

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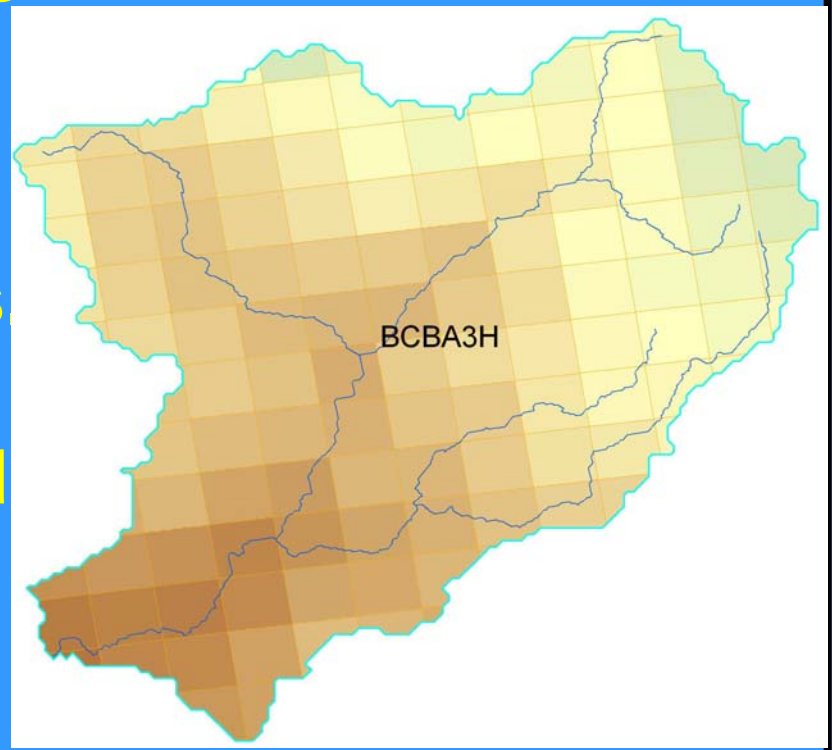
Concept

- A method to exploit the spatial and temporal information in the NEXRAD Stage III precipitation estimates.
- Divides the region based on the 4-km grid
- Inputs Precipitation, Calculates runoff, and routes the flow to the outlet point.



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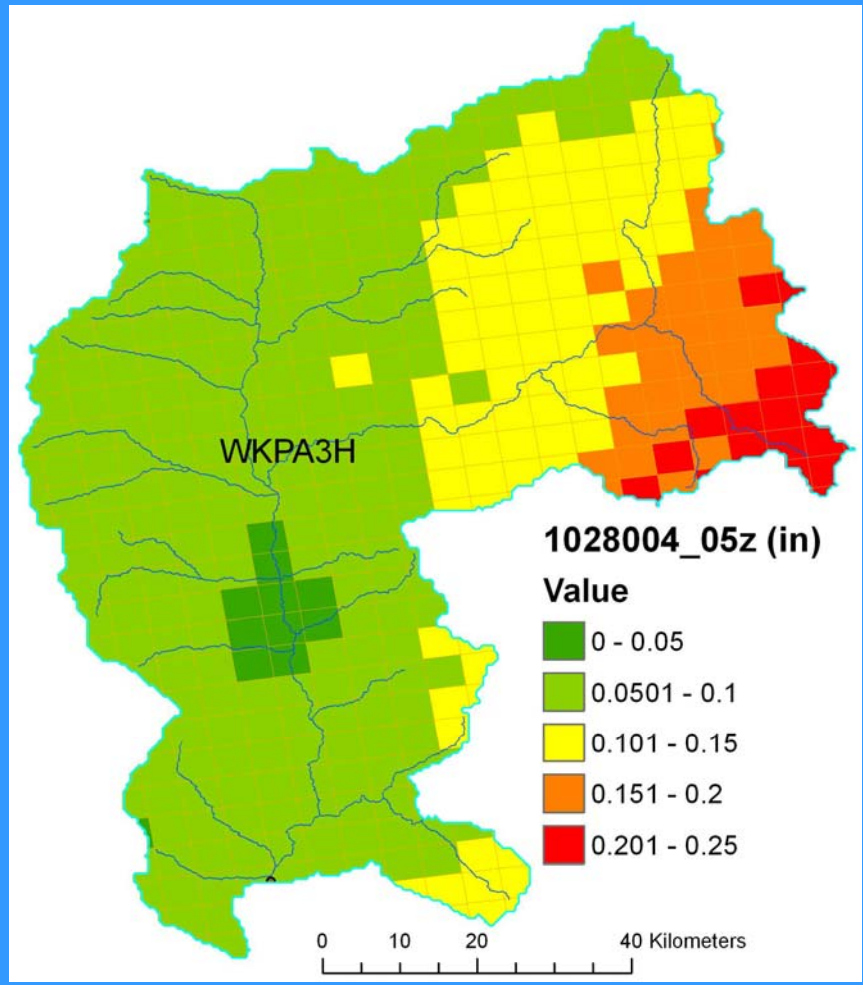
Precipitation Data

- Hourly Multi-Sensor Precipitation Estimate (MPE) grid values are input to the model.
- Combination of Radar, gage, and satellite precipitation estimates coupled with PRISM distribution data.



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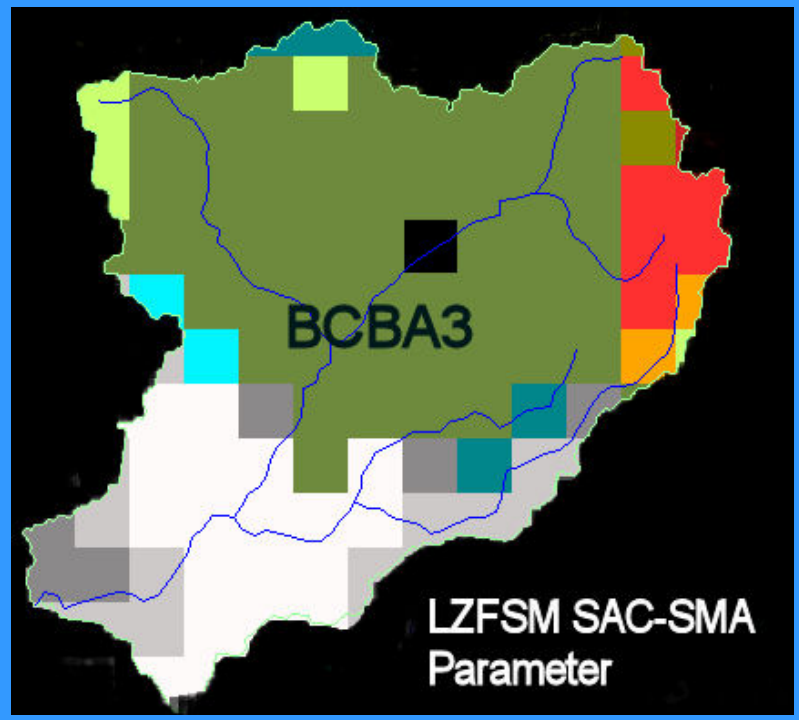
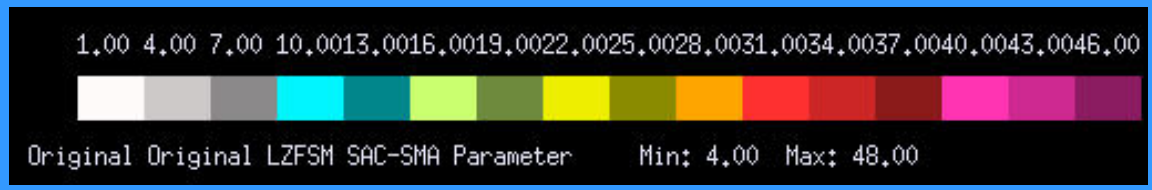
Soil Characteristics

- Sacramento Soil Accounting Method (SAC-SMA) parameters.
- Initially based on available data from the USDA and USGS
- Grid Parameters can be scaled during the calibration process





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Flow Routing and Cell Connectivity

- Hill Slope routing – requires Slope Roughness and Channel Density input grids. Calculates a discharge per unit depth.
- Channel routing using either rating curve information, or channel input grids – slope, roughness, shape and top width.

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Integrated GRIDs Concept

Water Resources Objectives: Integrated* Products & Services

Partners

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Federal Agencies

Tribal Agencies

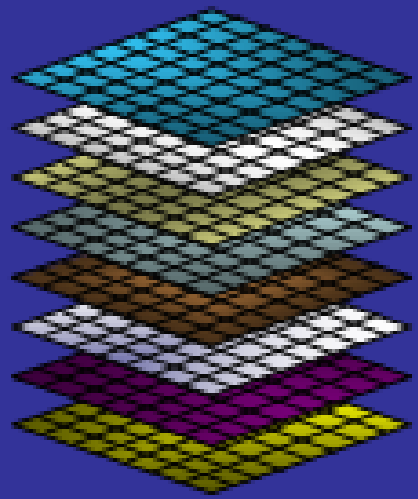
State Agencies

Local Agencies

Academia

Private Sector

High-resolution Gridded Water Resources Product Suite



- Precipitation
- Snowpack Properties
- **Soil Moisture**
- Evaporation
- Groundwater
- River Flow
- Surface Storage
- Runoff
- Water Quality

Applications

Drought Mitigation

Flood Potential

Flood Management

Water Allocation

Transportation

Emergency Management

Agriculture

Debris Flows

Ecosystems Management

Research

*Seamless transition from white water to blue water

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Output

- Time series can be output in to the existing Interactive Forecast Program (IFP).
- Can be also be displayed within the distributed model GUI.

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DMIP 1

Distributed Model Intercomparison Project (DMIP) – Year 2002

Twelve different distributed models from various universities and countries ran simulations for the same data sets

The NWSRFS lumped model was also ran to compare against as a ‘benchmark’ or reference and to try and improve upon

Participants were asked to make 30 simulations of various types

The difference between calibrated and uncalibrated models were also investigated

The input data sets were based on detailed NEXRAD grid precipitation

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DMIP 1 – Some Conclusions

The results of DMIP were published in: Journal of Hydrology Volume 298, Issues 1-4 October 2004

Lumped model outperformed distributed models in more cases than Distributed models outperforming lumped models.

Clear gains can be made in careful calibration of distributed models.

The were some gains in predicting peak flows from distributed models.

It is easier to obtain a priori parameters for lumped models through Calibration that obtaining parameters for a distributed model from physical Characteristics of the watershed.

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DMIP-2 Next Intercomparison Project

More Complex Hydrology

Mountainous Terrain
Snow, Rain/snow events
Soil Moisture Evaluations
Lumped vs. Distributed

Distributed Model Intercomparison Project (DMIP)

Phase 2 Scope

Tests with Complex Hydrology

1. Snow, Rain/snow events
2. Soil Moisture
3. Lumped vs. Distributed

Additional Tests in DMIP 1 Basins

1. Routing
2. Soil Moisture
3. Lumped vs. Distributed
4. Forecast mode tests

Note: DMIP 1 had 12 participants

DMIP 2 Participants

1.	Witold Krajewski	U. Iowa
2.	Praveen Kumar	U. Illinois
3.	Mario DiLuzio, Jeff Arnold	Texas A&M
4.	Sandra Garcia	U. Cartegena, Spain
5.	Eldho T. Iype	Indian Insititute Tech, Bombay, India
6.	John McHenry	Barron's Advanced Met. Service
7.	Konstantine Georgakakos	HRC
8.	Ken Mitchell	NCEP
9.	Hilaire F. De Smedt	Free University of Brussels
10.	Thian Gan	U. Alberta, Canada
11.	Newsha Ajami (Soroosh)	U. Ca. at Irvine
12.	Vazken Andreassian	Cemagref France
13.	George Leavesley	USGS
14.	Kuniyoshi Takeuchi	Japan
15.	Baxter Vieux	Vieux Assoc., OU
16.	John England	US Bureau Reclamation
17.	Dave Garen, Dennis Lettenmmaier	NRCS, U. Washington
18.	HL	